

CLAIMS

What is claimed is:

1. An apparatus for controlling the power at the output of an internal combustion engine, comprising:

5 (a) an electric motor coupled to the output of said engine; and
(b) a motor controller which varies engine power output with said electric motor.

2. An apparatus as recited in claim 1, wherein said motor comprises a
motor/generator.

10 3. An apparatus as recited in claim 1, wherein said motor controller varies positive
and negative output torque of said electric motor to vary engine power output.

15 4. An apparatus as recited in claim 1 wherein, for any given speed, said motor
controller sets engine power output in accordance with predetermined operating characteristics.

5. An apparatus as recited in claim 1, wherein said motor is coupled to a
transmission.

20 6. An apparatus as recited in claim 5, wherein the rate of change of ratio of said
transmission is controllable and further comprising means for controlling the rate of change of
ratio.

7. An apparatus as recited in claim 6, wherein said transmission is a continuously variable transmission.

5 8. An apparatus as recited in claim 6, wherein said transmission is an automatic transmission.

9. An apparatus for controlling the power at the output of an internal combustion engine coupled to a transmission wherein the rate of change of ratio of said transmission is controllable, comprising:

(a) an electric motor positioned between said engine and said transmission; and
(b) a controller which varies torque output of said electric motor and the rate of change of the ratio of said transmission wherein, for any given speed, the controller sets engine power output in accordance with predetermined operating characteristics.

10 15 10. An apparatus as recited in claim 9, wherein said transmission is a continuously variable transmission.

11. An apparatus as recited in claim 9, wherein said transmission is an automatic transmission.

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12. An apparatus for controlling the power at the output of an internal combustion engine, comprising:

- (a) a generator coupled to the output of said engine; and
- (b) a generator controller which varies engine power output with said generator.

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13. An apparatus as recited in claim 12, wherein said generator comprises a generator/motor.

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14. An apparatus as recited in claim 12, wherein said generator controller varies positive and negative output torque of said generator to vary engine power output.

15. An apparatus as recited in claim 12 wherein, for any given speed, said generator controller sets engine power output in accordance with predetermined operating characteristics

16. An apparatus as recited in claim 12, further comprising:
 - (a) an electric motor; and
 - (b) a motor controller which varies the torque of said motor;
 - (c) wherein said generator, said generator controller, said motor and said motor controller function as an electric continuously variable transmission.

17. An apparatus as recited in claim 16, wherein said motor comprises a motor/generator.

18. An apparatus as recited in claim 16, wherein the rate of change of ratio in said 5 electric continuously variable transmission is controllable and further comprising means for controlling the rate of change of ratio.

19. A control apparatus for an internal combustion engine driving a continuously variable transmission and a driveshaft coupled to said continuously variable transmission wherein the rate of change of ratio of said continuously variable transmission is controllable, comprising:

- (a) a generator/motor mechanically coupled to and driven by said engine;
- (b) a generator/motor controller electrically connected to said generator;
- (c) a motor/generator mechanically coupled to said drive shaft;
- (d) a battery electrically connected to said generator/motor controller and said motor/generator controller;
- (e) said generator/motor, said generator/motor controller, said motor/generator, said motor/generator controller, and said battery comprising said continuously variable transmission; and
- 20 (f) a controller which varies torque output of said generator/motor and the rate of change of the ratio of said continuously variable transmission wherein, for any given speed, said controller sets engine power output in accordance with predetermined operating characteristics.

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20. A control apparatus for a vehicle having an internal combustion engine driving a transmission, wherein said transmission has an output driving a first wheel at a first end of said vehicle wheel, and wherein the rate of change of ratio of said transmission is controllable, comprising:

- 5 (a) an electric motor driving a second wheel at a second end of said vehicle;
- (b) a motor controller electrically connected to said motor;
- (c) said motor coupled to said transmission through a road surface; and
- (d) control means for varying torque output of said motor and for varying the rate of change of the ratio of said continuously variable transmission wherein, for any given speed, said control means sets engine power output in accordance with predetermined operating characteristics.

10 21. A control apparatus for a vehicle having an electric motor driving a transmission and a battery system powering the electric motor, comprising a motor controller electrically connected to said electric motor wherein said motor controller varies torque output of said motor to be on an ideal operating line as determined by empirical testing of the electric 15 motor and battery system.

20 22. A control apparatus for a vehicle having an internal combustion engine and an electric motor, wherein said internal combustion engine and said electric motor are coupled to a continuously variable transmission, and wherein the rate of change of ratio of said continuously variable transmission is controllable, comprising:

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- (a) an engine controller mechanically connected to said internal combustion engine;
- (b) a motor controller electrically connected to said electric motor; and
- (c) control means associated with said engine controller and said motor controller for varying torque output of said motor and for varying rate of change of the ratio of said

5 transmission wherein, for any given speed, said control means sets engine power output in accordance with predetermined operating characteristics, and wherein said control programming includes hybrid, electric, and braking modes.

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